Patent Application of

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for

TITLE: **FOLDING TIE**

CROSS-REFERENCE TO RELATED APPLICATIONS : None

FEDERALLY SPONSORED RESEARCH: Not applicable.

SEQUENCE LISTING OR PROGRAM: None

BACKGROUND OF THE INVENTION - - **FIELD**

The present invention relates to apparatus for organizing and securing articles, and particularly to such apparatus for organizing and securing flexible elongate articles, such as cables, cords, tubing, laces, and the like.

- - PRIOR ART

It is well known that users have experienced many difficulties with tangled and misidentified cables, and other elongate articles. These difficulties have produced a multitude of different devices intended to assist in managing such articles. Examples of such devices in historical and common use are string, adhesive-backed tape, twist-ties, clips,

wraps, ties, holders, spools, sheaths, etc. Despite the large number of such devices, none of them have appreciated the advantages of weak securement for light-duty applications, such as computer cables. Additionally, in spite of the fact that electronics cables often look identical, thus raising a question as to their identity and appropriate connectivity, few of the devices for cable securement could be labeled to record and convey the identity or purpose of the cables. Moreover, in spite of the fact that cables are widely considered ugly, none of the cable-securement devices provided adornment or otherwise improved the aesthetics of gathered and secured cables.

String

String or twine (often waxed) is commonly used to manage elongated articles and it has many advantages, such as availability in bulk lengths, which may be cut to a specific length as needed. String is also reusable, reversible after untying, and it may be tied to itself, or joined to other lengths of string.

However, string suffers from numerous disadvantages. It must be tied, and knots are often hard to tie, especially in awkward or

constrained locations. They are frustrating and time-consuming to untie, especially after becoming hardened with time and exposure to the elements. String is also difficult to use in poor light conditions, or by someone with bad eyesight. String is wrapped and knotted, which normally requires two hands and good dexterity. Knotted string also typically provides an excessive degree of securement, and may not be released by simply tugging on the cables it secures. Tugged cables may damage equipment and cause a loss. Hence, string is largely unsuited to applications such as computer cables, which need to be lightly secured so they can be loosened by gentle tugging. An additional problem is that string itself does not readily provide a label for the article it secures.

Adhesive-backed Tape

Adhesive-backed tape is sometimes used to manage cables and other elongate articles. Among many other useful features, such tape may be supplied in bulk, and cut to length as desired. Tape may be intuitively used by simply folding it onto itself, across the cable, in such a way that the adhesive surfaces contact and bind to each other inside

the fold. Tape may also be written on to identify the cables it holds. However, adhesive tape suffers from numerous disadvantages. Common one-sided tape has adhesive on one side only, hence it is not reversible. I.e., it will only close when folded in one direction. Tape is often difficult to remove and frequently provides excessive securement. Tape commonly leaves a sticky residue after removal.

Twist-ties

Another device for managing cables is a length of malleable wire, sandwiched or covered on both sides with adhering strips of paper or vinyl, commonly known as a "twist-tie." Twist-ties are easy to use by simply folding them across the article to be held, and twisting the tie to close it. They are adjustable, reusable, and may be folded in multiple directions. They may be readily labeled by marking on the paper cover. Twist-ties can also be joined together to form longer ties, or joined together in branched or furcated forms. Twist-ties also attach to other twist-ties, serving to gather the articles they hold into groups or clusters. Another feature of twist-ties is that they may be provided in a long roll, and cut to length as desired. However,

twist-ties are often troublesome to open because this requires more twisting. Moreover, it is difficult to discern the direction of twisting required for removal. The wire core can be thin, and thus have dangerously sharp ends. The wire core can become fatigued and break after a few uses. Twist-ties also provide excessive securement, which may not be released by gentle tugging.

Clips, Brackets, and Guides

Clips, brackets, guides, and the like, are often used to secure extended or coiled cables, whereby one or more clips are attached to an anchoring surface, and the cable is held at one or more points along its length. One such clip-like device is sometimes called a cable catch. It is constructed with hook-and-loop fabric, and has both male (hook) and female (loop) on the same side of the open device. The two genders are juxtaposed across an axis of folding, so that the device joins hook to loop when it is folded. The closure is thus secured by joining the hook to the loop adjacent the folding axis, thereby holding an article in the fold. The device uses an adhesive to anchor it.

When anchored by an adhesive, such clip-like devices provide

excessively secure anchoring, from which the cables may not be freed by gentle tugging. Moreover, such adhesive devices cannot be moved with the cables when they are moved to another location, or when placed in storage. Such devices only have fasteners on one folding surface. Hence they will close only when folded in one direction. Such devices are not provided in bulk and hence may not be made to the desired size and shape; rather they are only available as discreet devices of limited sizes.

Knot Securement Devices.

A securement device utilizing a folding element equipped with releasable touch-surface fastener as its closure mechanism is shown in U.S. patent 4,291,439 to Riti, 1981. This device is used to secure a shoelace and to keep the knot from becoming accidentally untied. The device consists of a flat, foldable strip with both hook and loop on one side (in co-planar juxtaposition). The hook and loop members are juxtaposed across a single axis of folding, so that the device will close when folded, and will enfold and hold a knot placed in the fold. Riti uses simple folding for closure, and his device holds an article inside

the fold, thereby securing it. Riti's device is easy to construct, using commonly available materials, and is simple to operate by folding and unfolding. The device is anchored by an accessory lace passing through a hole in a laterally extending integral flap.

However, Riti's device is not intended to work together with others of its kind to manage multiple articles, but rather is a single, stand-alone device intended to secure a single knotted lace, as on a shoe. Moreover, Riti's device is not provided in bulk length; rather it is only provided in one size, adequate to accommodate a knotted shoelace. It requires a structural modification, in the form of a flap with a hole, and an accessory lace, to anchor it. Another disadvantage is that it only has fasteners located on one side. Hence it closes when folded in one direction only.

Article Holders

Re-configurable article holders may be made from flexible straps having hook-and-loop releasable touch-surface fastener elements. For example, US patent 5,104,076 to Goodall, 1992, shows a substantially T-shaped wearable device which may be selectively configured by

wrapping or folding to hold an article, and secured in the closed form by engagement of hook fastener to loop fastener.

Devices such as Goodall's have a complex construction, being formed as a T-shaped element with complex placement of the gendered hook and loop fastener members, and also require multiple steps to close and open the device. Such article holders do not work with others of their own kind, and do not permit the clustering, or modular inter-attachability, of held articles.

Cable Wraps and Bundling Ties

Numerous different cable wraps, often referred to as "bundling ties," or simply "ties," are used for managing slack lengths gathered in looped coils, or arrayed in parallel strands. Such devices are typically flexible straps which utilize touch-surface fasteners, such as hook-and-loop, for closure. One such wrap is seen in US patent 5,604,961 to Cole, 1997, which uses an elongate strap, with hook fastener elements on one side, and loop fastener elements on the other side. The strap is wrapped around an article, and then wrapped onto itself, whereby it is closed by connecting the hooks on one side of the flat strap, to the

loops on the other side. Thereby wrapping around, and holding, one or more articles. Such wraps may be provided in bulk form, consisting of a continuous roll of hook (male) backed with loop (female), which may be cut to length as desired.

Such common securement wraps provide excessive securement. Additionally, such ties are not useful for securing cables in non-parallel, crossed, or coiled, arrangements, but rather are only useful for bundling cables together in a parallel array. A considerable disadvantage to the majority of existing bundling ties is that few of them utilize folding as the sole operation of closure; rather they typically require wrapping. This requirement of wrapping-to-close is a distinct disadvantage. Wrapping, when compared to folding, is difficult to achieve, since wrapping requires two hands, and sight. Wrapping-to-close, and unwrapping-to-open is impractical in the cramped and dimly lit locations where cables are commonly found.

Cable wraps and bundling ties have other disadvantages as well. Some are not reusable. Many are intended only for storage conditions, and have no ability to manage cables in use. Many are

attached to a single cable only, while others may be used with separated cables, or with bundles of groups of multiple cables. Many prior-art devices require a buckle, clasp, cinch-ring, or other accessory component to secure their closure. Many are of complicated construction, and require modifications to secure the device in its closed form. Modifications take the form of slits, slots, tabs, notches, holes, Y-shaped elements, etc. Such structural modifications have a complicated and relatively expensive construction, and the devices are inconvenient to use, requiring two hands. Multi-step closure mechanisms are typically difficult to open, because opening requires multiple steps. Few cable wraps are reversible in their method of closing, i.e., they close in only one direction of operation, and are not capable of closing when operated in a generally reverse direction.

Few of the cable wraps or bundling ties of the prior art also anchor the articles they hold.

Few cable wraps provide an easy way to label the articles they hold. Where labeling is needed, it must be provided by a separate device, which does not secure the article.

Few cable wraps or bundling ties are made and distributed in bulk, but are supplied as discrete devices. This does not allow the user to easily fashion a device of the desired size and shape.

Some ties must be dedicated to the cable they secure, while others are removable for use with a different cable. Most ties that may be readily secured to a cable are not easily removable.

Many of the cable wraps or bundling ties of the prior art must be seen to be used, and so are of limited value for people with poor eyesight, or where the device cannot be clearly seen for reasons of lighting, or location. This is a significant disadvantage of many cable ties, since cables are often installed in dark or hard-to-reach places.

Another disadvantage of common bundling ties is that they will not easily allow the held articles to be releasably inter-attached to one another, i.e., clustered together, in a modular fashion. This disadvantage exists because most ties and wraps do not attach to others of their own kind while they are in the closed form. In the few instances where a closed tie may be used with devices of its own kind to form clusters of multiple held articles, the adjacent ties must be

wrapped in reverse directions. Otherwise they will all present the same fastener gender on the outside of the closed devices. Hence such wraps may not be connected to one another while closed. Thereby preventing the clustering, or inter-attachment, of adjacent closed devices.

A related problem exists in the general usage of releasable touch-surface fasteners for anchoring and securement of moveable articles. In spite of widespread use of two-gender touch-surface fasteners for anchoring moveable articles, there is no convention regarding the placement of male and female fasteners in such usage. Does one put the female gender on the anchoring fixture, or does one put the female gender on the moveable article? Lacking such convention, it is commonly found that when an article having only a single gender fastener thereon is moved to another location, there is a chance of finding the same gender fastener on the desired mounting point, thereby preventing coupling, and rendering the touch-surface fastener useless. There is no way to bridge and interconnect same-gender devices of the prior art. This lack of inter-operability is a real,

yet unrecognized, problem, since many devices have same-gender attaching surfaces exposed outwardly and could be joined in clusters, if the requirement for two different genders could be transcended. Strict gender-specificity is an accepted, galling limitation to all of the prior-art devices utilizing two-gendered coupling members.

In addition to the strict requirement for complementary genders on the articles to be joined, another long-accepted limitation of prior-art devices is the need for direct physical contact between devices utilizing touch-surface fasteners. The requirement for contact is problematic, since many articles, such as bundles of stiff wire, or hanks of rope, may be shaped or sized so as to interfere with direct surface contact between the bundling devices that secure them. Accordingly, there is an apparently unrecognized need for a way of attaching touch-surface fasteners together, where such fasteners may not touch.

Further unaddressed is the problem of aesthetics. Wires are commonly considered to be ugly, yet few prior-art devices are available for adorning such wires.

- - OBJECTS AND ADVANTAGES:

Accordingly one object and advantage of the invention is to provide an improved folding tie, other objects and advantages are to provide such a tie which:

(a) will releasably secure one or more articles;

(b) is reusable;

(c) is intuitive to operate;

(d) does not require wrapping to close;

(e) utilizes folding as the only necessary operation;

(f) is removable by unfolding;

(g) may be closed when folded in multiple directions;

(h) can be easily labeled;

(i) uses gendered fasteners for anchoring;

(j) may be used under conditions of bad visibility;

(k) may be used by persons with impaired dexterity;

(l) provides weak securement of the articles it holds;

(m) may be provided in bulk form and made into any size or shape;

(n) provides cable management in both storage and use conditions;

(o) attaches to identical devices while open or closed;

(p) attaches to any of common touch-surface fastener;

(q) permits modular inter-attachability, or clustering, of articles;

(r) may be used to secure and discretize individual articles;

(s) may be dedicated to the securement of a single article;

(t) may be removed for use with other articles;

(u) groups multiple articles together in a single bundle, and

(v) may be used in cramped spaces.

Further objects and advantages are to provide a folding tie that is inexpensive and easy to manufacture in any size, shape, and color; is fun and safe to use; which will readily allow modifications such as pins, ties, tabs or clips for improved form or function; adorns or obscures unsightly articles; which will hold non-elongate articles; and that sparks a synergy with prior-art devices, thereby providing new uses for existing ties.

Still further objects and advantages will become apparent from a consideration of the ensuing drawings and description.

SUMMARY

An improved article and method for managing articles comprises one or more folding ties, each comprised of a support element, having both genders of a releasable touch-surface gendered fastener, such as hook-and-loop, on both opposing sides, with the two complementary mating elements located equidistant from one another across an axis of folding. The device is used by folding it, to join male fastener to female fastener to form a releasable couple. In use, the tie enfolds and holds one or more articles. The tie also attaches to others of its own kind while in the closed form. The tie can be used to cluster, or modularly interattach secured articles. The tie forms clusters with like others, and provides securement, organization, and weak anchoring for the article or articles it holds.

DRAWINGS - - FIGURES

Fig 1 is a side elevational view of a preferred embodiment of a flat, two-sided, multiple interconnected segment and multiple gender tie (shown partially unfolded) according to the invention.

Fig 2A is a plan view of two interconnected fully unfolded folding

tie segments of Fig 1 shown in a common plane.

Fig 2B is an edge elevational view of two interconnected and fully unfolded folding tie segments of Fig 1.

Fig 2C is an edge elevational view of two fully unfolded folding tie segments of Fig 1.

Fig 2D is an edge elevational view of two fully unfolded folding tie segments of Fig 1.

Fig 3A is a plan view of two independent tie segments having the same fastener gender arrangement of the tie of Fig 2A, and having a discontinuity between segments spanned by a flexible loop.

Fig 3B is an edge elevational view of two independent tie segments having a fastener gender arrangement similar to Fig 2B, and having a discontinuity spanned by a twistable connecting loop.

Fig 3C is an edge elevational view of two independent interconnected tie segments having the same fastener gender arrangements as the tie of Fig 2C, and incorporating a discontinuity that is spanned by a twistable connecting element.

Fig 3D is an edge elevational view of two independent tie segments

having the same fastener gender arrangement as the tie of Fig 2D and flexibly interconnected by a twistable loop spanning a discontinuity in the backing element located between the segments.

Fig 4 is an edge elevational view of the two-segment folding tie of Fig 2B, folded about and holding an article.

Fig 5 is an edge elevational view of an eight-segment folding tie of Fig 1, repeatedly folded, in accordion-pleat fashion, for holding multiple articles, as both discrete articles, and as grouped multiple articles.

Fig 6 is an edge elevational view of multiple folding ties of Figs 2 and 3, folded closed, joined in clusters consisting of others of their own kind.

Fig 7 is a perspective view of a two-segment folding tie, being folded about, and holding an article in storage condition.

Fig 8 is a perspective view of a pair of two-segment folding ties being folded about multiple articles, and cooperating with one another as part of a system of holding articles in the use condition.

Fig 9 is a side elevational view of the folding tie of Fig 2 folded to

hold an article and anchored to a fixture by a single patch of adhesive-backed, gendered releasable-coupling touch surface fastener.

Fig 10 is a side elevational view of the tie used to join two incompatible cable wraps.

Fig 11A is a plan view of the tie with a label added to the support element.

Fig 11B is an edged elevational view of the tie of Fig 11A.

Fig 12 is a plan view of a second preferred embodiment of a tie according to the present invention, having multiple interconnected segments and multiple genders (shown unfolded) and having orthogonally repeating elements of the hook and the loop segments of the tie, with a label added to the support element.

Fig 13A is a plan view of a third preferred embodiment of the invention, having orthogonally repeating segments of the hook and the loop components of the tie arranged in a pattern suggesting a butterfly (shown completely unfolded).

Fig 13B is a plan view of a reverse side of the embodiment shown in Fig 13A, having both orthogonally and obliquely repeating elements of

the hook and the loop segments of the tie, with multiple labels added to the support element.

Fig 14 is a plan view of a fourth embodiment of the tie, having branched and repeating occurrences of gendered segments of the tie depicted in Fig 1, and incorporating multiple discontinuities in the interconnected segments of the tie (shown completely unfolded).

DRAWINGS - REFERENCE NUMERALS

20 Support Element

21 Discontinuity

22 Male Fastener Member

23 Female Fastener Member

24 Fold Zone

25 Spanning Element

26 Adhesive Layer

27 Held Article

28 Gendered Cable Wrap

29 Label

30 Support Element

31 Discontinuity

33 Decorative Component

34 Fold Zone

35 Spanning Element

36 Fixed Object

39 Label

40 Support Element

41 Discontinuity

44 Fold Zone

54 Fold Zone

DETAILED DESCRIPTION - - **Snake-Like Embodiment - - Fig 1**

Fig 1 shows a preferred snake-like embodiment of a folding tie according to the invention and comprising a generally flat body, consisting of an elongate support element or strip **20**, having opposing sides. The support element preferably is made of cloth, such as nylon, but alternatively may be of paper, or other fibrous materials, or of polymeric material, such as plastic, or of another woven, twisted, or knitted material, such as, webbing, ribbon, or rope.

Opposing sides of strip **20** have repeating independent and spaced fields, patches, or sections of both male and female genders of a releasable touch-surface fastener, such as hook-and--loop. Male (hook) and female (loop) patches **22** and **23** respectively, are present on both sides of strip **20**. Male and female patches **22** and **23** may each be formed as a laminate, which may be joined to strip **20** by adhesive, sewing, welding, or other method of affixing the patches to the strip. Alternatively, patches **22** and **23** may be formed as a unitary structure with strip **20**. Both male and female patches **22** and **23** are present on opposing sides of strip **20** in alternating occurrences.

Patches **22** and **23,** when located on the same side of strip **20,** are positioned on opposite sides of one or more fold zones **24,** which are defined by the relative positions of patches **22** and **23,** so that fold zone **24** constitutes the area of strip **20** between patches. Patches on the same side of strip **20** are approximately equidistant in relation to a median plane perpendicular to fold zone **24**. The act of folding strip **20** at any fold zone **24** brings male patch **22** into direct contact with female patch **23,** thereby forming a releasable coupling interface

adjacent the fold.

Fold zones **24** may be created on the area of strip **20** between adjacent patches **22** and **23**. In lieu of providing the material of strip **20** between patches **22** and **23** , a gap or discontinuity **21** may be provided between two or more patches. Discontinuity **21** is bridged by one or more spanning elements **25**, which flexibly interconnect separated segments of strip **20** across gaps **21**. As illustrated in Fig 1 and others, spanning element **25** may be formed by a loop of knotted string or other flexible filament. Inclusion of flexible spanning element **25** across gap **21** permits the tie to twist and fold where spanning element **25** bridges gap **21.** Twistable element **25** also imparts conformational flexibility to the tie (as shown in Fig 14). Twisting-spanning element **25** also permits variability in coupling behavior, since opposite sides of the tie may differ with regard to the placement and gender of patches **22** and **23**. Twisting segments of backing strip **20** at narrow spanning element **25** may change the same-side gender relations of the tie, relative to patches **22** and **23,** thereby creating variations in coupling when the tie is folded at discontinuity **21**.

The long, snake-like tie of Fig 1 may serve as a long folding fastener, or may be cut into ties of shorter length. This is illustrated in Figs 2A, 3A, and others, where folding ties are illustrated as shorter sub-units cut from the longer tie of Fig 1. The dimensions of the tie are appropriate to the size of the articles being held, and for cables commonly found on personal computers, patches **22** and **23** would be approximately two to 20 cm (one to eight in) in length and from two to 20 cm (one to eight in) in width.

Folded Forms

The snake-like embodiment of the tie has an unexpected and useful property when it is constructed of a support element having multiple, regularly spaced segments of repeating fields of male and female patches **22** and **23** on opposing sides, as illustrated in Fig 1. When such a tie is repeatedly folded in alternating directions, at each adjacent fold-zone, it forms an accordion-pleat arrangement. Such a repeatedly folded form of the tie will grow in length, to form a semi-rigid, "stack," as illustrated at the bottom of Fig 1. If the stack has sufficient length, it will flex and curve, and can be attached to itself, end-to-end,

and form a circular, ring-like embodiment (not shown) which has useful applications.

Folding and Planar Relations - - Figs 2 and 3

Figs 2A et seq. show the folding and planar relations of patches **22** and **23** where fold zone **24** is defined in the area of strip **20**, between longitudinally spaced segments or patches of different gender fastener elements **22** and **23**. Fold zone **24** is approximately equidistant between the two chosen spaced patches **22** and **23**. Figs 2B through 2D illustrate that patches **23** and **22** can be located with identical gender type patches back-to-back (Fig 2B), opposite gender type patches back-to-back (Fig 2C), or with blank areas, i.e., just support element **20**, backing both gender type fasteners (Fig 2D).

The coupling pair of male patches **22** and female patches **23** on one side of strip **20** can be located without regard to the placement of the male and female fastener elements on the opposite side of support element **20**, as shown in Figs 13A and 13B.

In Figs 3A et seq. strip **20** has discontinuity **21** between the spaced free ends of support element **20A** and **20B.** Such ends adjacent gap **21**

are spanned by substantially narrow, flexible spanning element **25** interposed in discontinuity **21.** Flexible spanning element **25** permits support element **20A** to twist freely and independently of support element **20B**, and to fold at discontinuity **21.**

The tie of Figs 3C and 3D may be twisted at narrow spanning element **25** to vary the arrangement of genders of patches **22** and **23** on the same side of strip **20**, thereby permitting user-selected mating surfaces when strip **20** is selectively twisted at narrow element **25** and folded at discontinuity **21.**

The tie of Fig 3C will fold at discontinuity **21** to connect patches of male gender (hooks) **22** to patches of female gender (loops) **23.** However, if discontinuous support element **20A** (on the left side of the tie of Fig 3C) is twisted 180 degrees (at narrow element **25**) relative to companion segment **20B** (on the right side of Fig 3C), the resulting tie will not have both male and female fastener elements **22** and **23** on both sides. Hence it will not close when folded.

Similarly, in Fig 3D, discontinuous element **20A** (on the left side) may be twisted 180 degrees (at element **25)** relative to discontinuous

support element **20B** (on the right side) to form a tie which will not close upon folding at discontinuity **21**. Such user-selectable variability in closing behavior is useful in applications where it is desired that the tie not close when folded. Such functionality is uncommon.

Operation - - Folding - - Figs 4 and 5

Fig 4 shows how folding connector strip **20** folds along fold-zone **24** to bring male patches **22** and female patches **23** into disengageable contact. The tie is operated by simple folding, causing direct contact to be made between male and female patches **22** and **23,** which are both located on the same side of strip **20**. When backing element **20** is folded at zone **24**, the interface of male and female patches **22** and **23** forms a releasable coupling bond in the fold, and the tie is thereby closed. Repeated folding and unfolding at axis **24** results in repeated closing and opening of the tie.

The folded tie of Fig 4 holds a moveable article **27**, which may be a ring, wire, hose, pipe, etc. Fig 4 also shows the presence of both male patches and female patches **22** and **23** on the outside of the folded form. These outside coupling members in Fig 4 are not shown in use,

but can be easily used to attach another tie (Figs 5 and 6) or any patch of hook or loop fastener. A gendered fastener patch may be affixed to a stationary object **36** (Fig 9), and thereby provide anchoring.

Fig 5 shows a segment of the tie of Fig 1. The tie of Fig 5 is repeatedly folded at adjacent fold zones **24** and discontinuity **21**, thereby enfolding and holding separate articles **27A** through **27E**. When the tie is folded at a fold zone **24** or a discontinuity **21** it will hold articles **27** by enfolding and securing them, using the bond of male-to-female patches **22** to **23,** respectively, and detachably forming a releasable couple inside the fold. Enfolding holds articles **27**, and furthermore provides a way to organize such articles in an improved fashion; by clustering and anchoring them. Fig 5 also shows that a single fold may hold large or small articles **27** which may be weakly anchored, and easily unsecured by tugging.

Operation - - Bundling and Discretizing - - Figs 5 and 6

Fig 5 illustrates that multiple articles **27** may be gathered and held in a bundle by the tie. Additionally, articles **27A, 27B** and **27D** may be secured as discrete singles, and held apart, separated from other

articles held by the tie. Fig 5 also illustrates that a single tie may be used to secure articles in groups of multiple articles (**27E** and **27C**).

Fig 6 shows articles **27A, 27C,** and **27D** held as discrete individuals, in separate closures of individual ties. Fig 6 also shows that collected groups of multiple articles **27B** and **27E** may be bundled together and held by a single fold of an individual tie.

Operation - - Clustering - - Fig 6

Fig 6 shows several ties similar to the ties depicted in Figs 2A and 3A that are clustered together and holding articles **27**. The ties of Fig 6 are folded, at zone **24** and discontinuity **21,** to hold article **27.** When folded closed, the tie has both patches **22** and **23** on the outside of the folded form; therefore the tie will releasably adhere to others of its own kind while in the closed form. Patches **22** and **23**, which are outwardly exposed, impart modular inter-attachability between multiple ties, and hence, the unique ability to cluster together articles **27** that are enfolded and held by the ties shown in Fig 6. Clustering provides simple, weak securement of articles **27**. The characteristic clustering behavior of the tie allows articles **27** to be attached to either

patches **22** or **23** in an easily formed, weakly secure, cluster from which they may be released by simply tugging on article **27** or by tugging on the tie.

Operation - - Holding - - Figs 7 and 8

Fig 7 depicts a tie securing cable **27**, shown in the coiled condition, as for storage. So held, cable **27** may be joined to any occurrence of fastener patch **22** or **23**. Fig 8 depicts two ties holding multiple cables **27**, illustrated as an extended group of several cables **27** in the in-use condition. So folded, and having both fastener patches **22** and **23** on the outside of the folded form, the tie may be joined to any of patches **22** or **23**. The cables held in this fashion my be released by tugging.

A single long tie will hold a coiled cable (not shown) at multiple points on a circular coil in such a way that the cable will retain its neatly coiled form during rough handling. The securement of a coil at multiple points, using only a single tie, is believed to be a novel feature in cable management, since such coils have heretofore been secured at only a single point, as shown in Fig 7.

Operation - - Anchoring - - Fig 9

Fig 9 shows how the tie anchors articles to a fixture **36**. The presence of both male (hook) and female (loop) patches **22** and **23,** exposed on the outside of the folded tie, imparts the ability to anchor the tie by attaching it to any corresponding patches of common hook or loop patches **22** or **23**. When the tie is folded closed to enfold and hold one or more articles **27**, as shown in Fig 9, it may be joined to an anchor point, consisting of a stationary female patch **23**, thereby forming a releasable couple and anchoring article **27**. Such anchoring patches may be permanently joined to a fixed object **36**, such as a wall, using adhesive **26,** or another fastener, such as a nail or staple (not shown). By making use of common hook-and-loop fasteners, the tie provides relatively weak and easily removable anchoring from which cable **27** may be pulled loose by simple tugging. Fig 9 shows female patch **23** as the anchor attached with adhesive **26** to fixture **36**. In practice, adhesive-backed patch (either male or female) **22** or **23** will anchor the tie, since the folding tie has both genders on the outside of the folded form. Tugging will release the cable; the tie need not be

untied.

Operation - - Spatial Bridging and Gender Bridging - - Fig 10

The tie, having both fastener patches **22** and **23** exposed outwardly, joins with compatible gendered devices of the prior art, as well as to others of its own kind, so the folding tie works synergistically with existing devices, solving prior inoperability between devices used to manage slack cables and wires.

In its unfolded form, the tie has both patches **22** and **23** on both sides of strip **20**. Fig 10 illustrates the ability of the tie to bridge the space between two gendered fasteners. The tie bridges the space between common gendered cable wraps **28A** and **28B** and joins them. I.e., two prior-art cable wraps **28A** and **28B** are joined together without actually touching one another, by making use of the tie as an intermediary member serving as a spatial bridge.

Fig 10 also illustrates the gender-bridging capability of the tie. Two common gendered cable wraps **28A** and **28B**, both of which are wrapped closed, and have the same female gender fastener member **23** on their exposed surfaces. In spite of gender incompatibility, wraps

28A and **28B** are joined together in a modular cluster, by using the folding tie, in its unfolded form, as a bridge. The joining of like-gendered cable wraps **28** was formerly considered impossible, yet is possible with the present tie.

The trans-gender and spatial bridging utility of the tie represents an improvement to the usefulness of, and a synergy with, gendered prior-art ties, and provides an improvement to the art of managing cables, and other such light-duty applications.

Operation - - Labeling - - Figs 11A and 11B

Figs 11A and 11B illustrate that labeling can be readily provided on and by the tie. Strip **20** may be used to provide a label **29** on the tie. Label **29** can be used to record and convey information, such as identity, source, destination, time, notes, etc., and may include conventional lettering or numbering. Such a label may also utilize machine-readable code, such as bar coding (shown in Figs 12, 13B and 14). The label may be pad-like, with appropriate indicia, as shown, or it may comprise indicia integrated, or applied directly to strip **20.** The tie of Figs 11A and 11B, having both male and female fastener patches

23 and **22** adjacent fold zone **24**, may be used to enfold and hold any article, and provide all of the useful benefits of the tie, or it may provide uncommon utility as an easily attachable, and easily removable, reusable label for another gendered device.

Sheet-like Embodiment - - Fig 12

Fig 12 shows a sheet-like embodiment of the tie. The tie comprises a two-dimensional, substantially flat, support element **30**, having both male and female patches **23** and **22** on both sides, arrayed in rows and columns. Sheet **30** utilizes polymeric, woven, knitted, fibrous or other foldable support material extending in longitudinal and lateral directions. Sheet **30** has adjacent, repeating segments or fields of male (hooks) and female (loops) patches **22** and **23**, in a co-planar arrangement on both sides of sheet **30**, with male and female patches **22** and **23** longitudinally and laterally spaced across adjacent fold zones **34**.

Sheet **30** folds at one or more zones **34** to join male fastener patches **22** to female fastener patches **23**, inside the fold, and so may hold one or more articles in each fold. When folded, the tie has both patches **22**

and **23** of the gendered pair on the outside. Hence, the folded, i.e., closed, tie will releasably engage another patch of either gender **22** or **23**.

The sheet shown in Fig 12 may be used to secure articles, and also may be used as a bulk material to create smaller folding ties, which may be cut from the bulk material to make smaller sizes and different shapes. The tie illustrated in Fig 2A may be cut from the bulk form of the folding tie illustrated in Fig 12. In addition to providing material for cutting to smaller size, the sheetlike embodiment shown in Fig 12 has all of the characteristics and useful properties of the tie, including the ability to secure and manage moveable articles, as previously described. The tie of Fig 12 may be folded, at one or more fold zones **34**, to enfold one or more articles. While so folded, and while enfolding and holding one or more articles, the tie may be fastened to either patches **22** or **23** to provide anchoring for the article. The sheet-like tie of Fig 12 may be of any dimensions, as it is used to provide bulk source material for making smaller ties.

In bulk applications for providing ties for managing computer cables, backing element **30** may be continuous, and fastener patches **22** and **23** can be approximately two to 20 cm (one to 8 in) in length and from approximately two to 20 cm (one to 8 in) in width. The sheet-like tie of Fig 12 may be used to secure one or more articles, and where backing element **30** is of relatively much greater size than the article it secures, the folded tie may entirely engulf one or more articles inside a fold. The tie of Fig 12 also has label **39** added to support element **30**.

Decorative Embodiment - - Fig 13

A preferred decorative embodiment shown in Figs 13A and 13B shows a tie having aesthetic value. The tie of Fig 13 suggests an image of a butterfly. Backing element **40** is formed in the shape of butterfly wings. An additional decorative component **33** is added to suggest an image of the body and antennae of a butterfly. Decoration **33** may also provide label **39**, as shown in Fig 13B. Figs 13A and 13B show opposite sides of the same tie in plan view, illustrating the variability of the back-to-back, and same-side, arrangement of segments of fastener patches **22** and **23**.

For labeling, securing, and ornamenting cables of the kind associated with computers, the backing element of the tie shown in Fig 13 can be from about 10 to 20 cm (three to 8 in) in width and from about five to 20 cm (two to eight in) in height. The size and arrangement of fastener patches **22** and **23** varies with the pattern, or suggested image, created by the segments of fastener patches.

Fig 13A illustrates an orthogonal pattern, suggesting the markings on a butterfly's wings, created by placement of patches of male and female fastener elements **22** and **23**, respectively, on backing element **40**. Element **40** folds at zones **24** and **44** to join patches of male fastener **22** to patches of female fastener **23**.

Fig 13B illustrates patches of male and female **22** and **23** placed in an oblique and irregular arrangement on the left side of element **40**. The right side of element **40** shows an orthogonal arrangement of fastener patches **22** and **23**. The irregular arrangement of fastener patches **22** and **23**, on the left side of element **40**, causes this tie to have an irregular arrangement of folding axes **54**. The tie of Fig 13B will join male fastener patches **22** to female fastener patches **23** when folded at

one or more fold zones **24, 34, 44** or **54** and may selectively enfold and selectively hold one or more articles.

Fig 13B also shows label **39** on backing support element **40** as well as on decorative component **33.**

The tie of Figs 13A and 13B may also be attached to an ordinary gendered cable wrap having either exposed gender, thereby providing ornamental aesthetic as well as gender bridging, spatial bridging, anchoring, labeling, and other useful benefits.

Branched Embodiment - - Fig 14

Fig 14 shows a star-like, or branched, preferred embodiment of the tie. The tie is constructed from materials and components which are substantially similar to the embodiment of Fig 1, and has similar dimensions. Fig 14 shows several lengths of strip **20** including a furcated form, with alternating segments of fastener patches **22** and **23**. Fig 14 shows that strip **20** may be discontinuous, as previously discussed relating to Figs 3A to 3D, with discontinuity **21** spanned by flexible element **25.** Discontinuity **21,** spanned by flexible element **25,** permits both folding and twisting of support element **20**. This twisting

and folding axis **21** is seen in Figs 1, 3, and others. Narrow flexible element **25** is illustrated as a loop of string, which may be of any length, as shown by loop **25A**, which is a longer loop of knotted string shown spanning discontinuity **41**. Flexible connector **25** may also be made of two crossed filamentous strands (not shown), or a single straight filament (not shown), or swivels (not shown), or links, or any twistable element providing a spanning interconnection of segments of support elements **20** across gap **21** between segments **20**.

The center of Fig 14 also shows composite folding twisting loops **35** interconnecting multiple segments of support element **20** where support element **20** is interrupted by discontinuity **31**. Flexible-twisting loops **35** are shown in the center of Fig 14 as several loops of string linked together and joining multiple converging discontinuous segments or arms of strip **20**. Spanning elements **35** interconnect elongate arms of strip **20** radiating outwardly from the central point of discontinuity **31** like the legs of a spider, or the rays of a star.

Fig 14 shows that such a furcated tie may be constructed, in whole or in part, with continuous strip **20** having no discontinuities. The star-

like embodiment folds at zones **24** and at discontinuities **21, 31** and **41,** joining male fastener patches **22** to female fastener patches **23,** forming a releasable couple to enfold and hold one or more articles. The tie of Fig 14 will fold repeatedly at folding axes **24,** and at gaps **21, 31** and **41**. Each branch of the tie may form a releasable couple with any other branch; hence the tie is useful for holding rounded or non-elongate articles of any size or shape. The tie of Fig 14 is also useful for securing together multiple cables which are in non-parallel arrangement.

The tie shown in Fig 14 also has label **39** added to support element **20**, as well as label **39A** added to support element **20A**. The tie of Fig 14 readily provides identification, weak securement, anchoring, and clustering, as well as a trans-gender bridge, and a spatial bridge, thereby manifesting unique characteristics.

Conclusion

It will thus be seen that the tie folds to hold articles in storage or use. The tie is simple to construct and use, and provides holding, clustering, anchoring, and labeling for one or more articles. The tie

may be provided in bulk form, to be sized and shaped as desired. It is infinitely adjustable to provide for the weak securement of articles of any size or shape and easily opens to permit removal or rearrangement of the articles held. The tie is reusable, has a long lifespan, and is well suited to temporary or permanent installation in hard-to-reach places.

In addition to the easy labeling ability it offers, the tie may be used to provide adornment, and to improve the appearance of unsightly articles, such as computer cables.

When constructed with hook-and-loop fasteners, the tie is easy and inexpensive to make. It is also safe to use, and it makes a good toy.

Because it does not need knotting or wrapping to close, the tie is easy to use in cramped spaces, or in bad lighting conditions, and may be closed with one hand, even by someone with impaired dexterity.

The tie requires only the single, simple, intuitive step of folding to close. It does not require an additional accessory component to close, nor does it require special structural modifications to close. It uses the simplest arrangement of gendered surface fasteners to close, and also

to anchor the tie. Hence, anchoring the tie requires no structural modifications, or added accessories, and needs only the single operational step of touching it to either gender of a touch-surface fastener.

The tie is useful for grouping multiple articles together in a single bundle, grouping multiple bundles together, or holding discrete individual articles apart from one another. Anything the tie holds may be collected in clusters with other ties. Such clustered cables need not be arranged in parallel orientation, but may be arrayed in crossed or coiled orientation.

In addition to simply folding, the tie can be provided with a twisting axis comprising a freely-twisting narrow spanning element crossing a discontinuity in the support element. The inclusion of this spanned discontinuity in the support element constitutes a previously unsuggested modification to foldable cable management devices. The narrow flexible connector joining two discontinuous adjacent segments of the support element permits the free twisting of the segments in relation to one another and imparts conformational

flexibility to the tie. The same loop used to enable twisting also permits users to thread a connecting strand through such loops of the tie, thereby providing another way to anchor the tie, or of connecting multiple ties together, or attaching a label. The tie provides new and unusual capabilities for the practice of managing moveable articles, providing an unprecedented ability to easily manage articles such as computer cables, as well as providing a welcome and much needed addition to existing materials and practices of slack management. There are numerous methods for managing slack, elongate articles, however no known prior-art devices also provide weak holding, clustering, anchoring, and labeling for such articles.

In terms of ease of use and utility, the tie may be considered to combine the usefulness of a twist tie with that of adhesive tape. The tie goes further to provide other much-needed capabilities neglected by existing art.

Even more unusual properties of the tie are manifest in the repeatedly-folded, ring-like form, which may be handled or stored by using the open center of the ring, into which an article or fixture may

be inserted. Alternatively, the ring can be releasably formed around an article or fixture, for easy storage or handling. Moreover, when the tie is made into the ring-like form, all of the mating surfaces are occupied, so the ring-like form may be stored loosely with other hook-and-loop devices, without the fasteners unintentionally engaging one another. The tie manifests unusual properties in use.

The tie works synergistically with currently-installed cable wraps that utilize common touch-surface fasteners. The unique property of having both genders on both sides imparts bridging utility that enables presently impossible uses for common cable wraps, thereby permitting previously unknown uses of prior-art devices.

Because the tie has both genders on both sides, and may be of any thickness, or shape, or length, it will bridge the gap between other joining surfaces. The strict and galling requirement for direct physical contact between touch-surface fasteners is an unquestioned limitation, and an apparently unrecognized problem, that is solved by the tie.

The tie also provides gender-bridging, permitting previously impossible combinations of hook-and-loop to be used, and solving

another unrecognized problem, i.e., the strict requirement of gender compatibility between gendered fasteners. The strict need for gender compatibility makes conventional hook-and-loop fasteners impractical for many applications. By way of illustration of this very real, but unrecognized, problem, it is increasingly common to use conventional adhesive-backed hook-and-loop fasteners to mount lightweight moveable articles such as remote-control units, accessories, etc., to a fixture, such as a wall, work bench, article of furniture, etc. Although it is very handy for temporarily mounting something, such use is restricted by the unquestioned and unavoidable requirement for a male fastener (hooks) to be on one surface, and a female fastener (loops) on the other. There is no accepted convention regarding the placement of hook-and-loop on such articles . It is commonly found that when an article having a single gender fastener member thereon is moved to another location, there is an equal chance of finding an identical gender fastener member on the mounting fixture, thereby preventing the desired coupling and rendering the fasteners useless.

The folding tie, having both genders on both sides, provides a

gender-positive bridge, thereby transcending a conventional limitation and enabling uses that are impossible under limitations that are currently accepted as natural and unavoidable.

Scope - - Variations in Construction

Several embodiments are shown having variations in shape and size of the tie. The forms shown should not be construed as limitations on the scope of the invention, but rather as exemplifications of several preferred embodiments. Other embodiments are possible. The tie may be made of any size or shape, or any color or likeness. The support element need not be flat, but may be pillow-like, or rope-like, or like a string of beads. The backing support element has been shown to be flexible, but a rigid or semi-rigid support element having a folding zone would also suffice for the requirements of the present invention. The embodiments of the tie incorporating a twist/fold zone show a single flexible connecting loop providing the twisting properties, but such spanning may also be provided by one or more filamentous connectors, or by one or more narrow, flexible connectors between discontinuous segments of the tie.

The flexible, twisting-spanning element across the gap between adjacent discontinuous tie segments has been shown joining adjacent edges, but such a spanning element could just as well connect adjacent non-contiguous segments of the support element at their centers, or at the corners, or both, to provide a tie according to the present invention. The discontinuous segments of the backing element have been shown spanned by a single spanning element, but such discontinuous segments may be interconnected by multiple spanning elements as well. The areas of gendered fastener members on the support element may be of any size or number, and may be formed as a laminate joined to the support element by adhesive, sewing, welding, or any other method of affixing the layer containing the releasable touch-surface fastener to the support element. Alternatively, the fields of gendered fastener members may be formed as a structure unitary with the support element, or may be twisted as spiral strands in a foldable, rope-like, support element.

The tie may be wrapped to close, as well as folded to close.

Rumb3) The tie can have infinite variations in form, construction and

components, so long as it has a foldable support element having a plurality of opposing major sides, and has at least two male fastening members on respective opposing major sides of the support element and at least two female fastening members on respective opposing major sides of the support element. This enables one or more of the male fastening members to be detachably connected to one or more of the female fastening members, to form one or more releasable couples when the support element is folded to place one or more of the male fastening members in contact with one or more of the female fastening members.

The opposing sides of the tie need not be identical, or even approximate one another. The two joining surfaces on the same side and divided by the fold need not be identical, or even similar to one another, but may have greatly different arrangements of the gendered fastening members, thereby imparting differing interfacial coupling behavior when the tie is selectively folded across different folds. The pattern of the fasteners may be arranged in regular, repeating arrays, or may be arranged freely, or to convey an image

or a pattern. Colors may be added for decoration, or to create an image or pattern.

The surface fasteners used for the tie may be male and female fasteners, as previously outlined, or hermaphroditic as well, so long as both coupling members are present on opposing sides of the tie, with the coupling members on the same side located equidistant from a fold zone.

The tie may be assigned meaningful variations in color, size, shape, etc. to provide informational or labeling properties useful to organizing and managing moveable articles. The label of the tie may be integral with the support element, or may take the form of three-dimensional pads attached to the tie. The labels may convey visible and human-readable code, such as recognizable images, numbers, or letters, or may also convey machine-readable code, including such techniques as code imaging, reflectance, fluorescence, etc.

In addition to using direct force of fingers to achieve folding closure, the tie may incorporate, for example, a spring-like closure mechanism (not shown), providing a self-folding function. Other

modifications, such as folding securement flaps (not shown), or clips (not shown), may be added to provide for operation of closure, or securement of closure. Tabs for grasping (not shown), may be added for use in opening of the tie. Ties, pins, or clips (not shown) may be added to the tie to provide an additional way to attach the tie to the held article, or to anchor the tie, or attach it to another tie. Additional modifications, such as ornamentation for amusement or aesthetic value, may also be readily made to the present tie. Tags may be attached to the tie. The tie may be separate from the article to be held, or it may be temporarily or permanently affixed to the article.

The usefulness of the folding tie for electrical wires or network cables is apparent, but the tie is also useful for any elongate, flexible article, including hose, tubing, twine, rope, plants, and the like. In addition to the management of flexible articles, there is application of the tie to rigid and semi-rigid elongate articles, such as rods, pipes or poles. Suchlike articles may be organized, connected, identified, ornamented, and secured together with one or more folding ties. The ties also hold and secure easy-to-lose components and accessories,

which may be joined together in clusters and anchored for keeping.

Being of any size or shape, the tie has the ability to hold and anchor any and all solid moveable articles, without regard to their size, shape, or flexibility; hence the uses for the tie are not limited to electronics, but include medical, entertainment, industrial, shipping, transportation, construction, apparel, decor, manufacturing, forestry, farm, military, police, or ranch applications; wherever moveable articles of any sort need management and organization including labeling, securement, or anchoring.

The tie may be used as a wearable item, such as may be attached to a belt, and used to hold articles alongside the wearer. The tie may also be used as a temporary jig for holding articles to be assembled. The tie may be used for bandaging, or animal restraint. The folding tie will secure, anchor, and label any solid thing of any shape or size.

The usefulness of a foldable surface having both genders of a touch-surface fastener on opposing sides is previously unappreciated. The folding tie constitutes a new, double-sided, pseudo-hermaphroditic, article management tool which may be made from

common hook-and-loop fasteners. The seemingly obvious need for weak securement, and clustering, has been unaddressed prior to the present. The folding tie fulfills these seen and unseen needs with unusual functionality and ease of use.

Accordingly, the scope of this invention should be determined not by the embodiments presented for illustrative purposes, but rather by the scope of the appended claims and their structural and functional equivalents.